



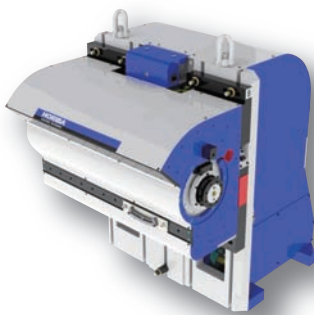
A Complete Hardware-in-the-Loop (HIL) Driveline Test System Featuring Advanced Engine Simulation Virtual Engine

Shorten the Product Launch Cycle

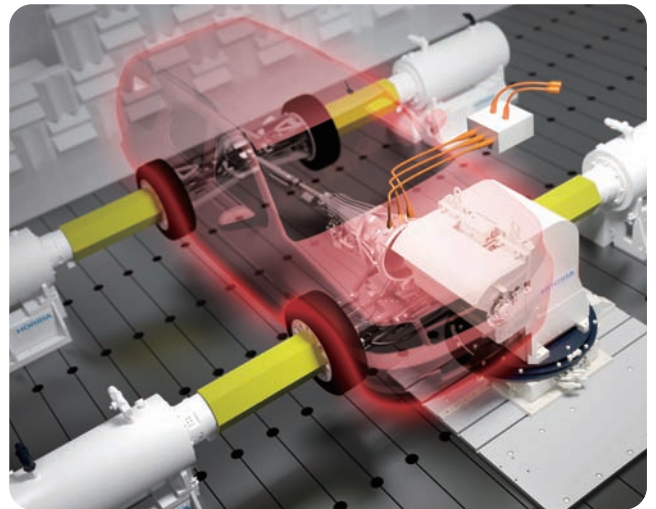
- Use production-intent engine performance characteristics early in the development cycle
- Eliminate invalid tests due to incorrect engine calibration
- Easily connect and test any type of transmission as if it were installed in a real vehicle
 - FWD and RWD
 - Right-hand and left-hand output shafts
 - HEV, DCT, CVT, manual, and automatic
- Improve test repeatability with predictable, controlled "engine" performance

Increase Test Cell Efficiency

- Quickly set up single cylinder to V16 "engines" of different fuel types and displacements to get different torque signatures
- Test transmissions of varying sizes (with inertia values up to 0.5 kgm²)
- Eliminate frustration and costs associated with fueled engines :
 - No fuel handling
 - No exhaust extraction
 - No engine calibration
 - No bolt-up headaches



Ultra-High Response Dynamometer
[DYNAS TP260]



Virtual Vehicle Testin

Virtual Engine uses advanced software control and a specialized AC dynamometer to accurately simulate IC engine performance.

Reduce Capital and Operational Costs

- Eliminate costly and labor-intensive prototype engines prior to test start up
- No engine cooling requirement
- No fuel, oil, filters or labor for engine maintenance

Expect Excellent Correlation to ICEs

Virtual Engine accurately replicates the torque signature of an internal combustion engine (ICE) using real-time closed loop feedback with adaptive control algorithms. The closed-loop adaptive controls compensate for :

- Mismatch between real engine inertia and input dynamometer inertia
- Mechanical dynamics due to specimen and attachment properties
- Electro-mechanical conversion of energy at different torque levels and speed

Three-Part Solution for Driveline Development and Validation without a Fueled Engine

Advanced Simulation Software

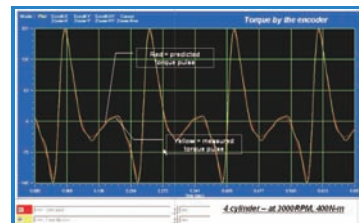
Advanced, torque-control based, real time model of ICE. Provides 48 engine orders, closed loop torque correction in amplitude and frequency, and correction for friction loss. Includes simulation of engine torque management schemes for driving and operating events. Generates CAN bus messages and/or special pulse train signals to satisfy any power train control unit.

● Engine Controls Simulation (ECS)

- Altitude affects, Fuel cutoff
- Variable displacement
- Accessory load variations
- Electronic throttle
- Torque intervention schemes
- Engine start/stop strategy
- Timing & Position Pulse Train

● Engine Torque Pulsation Simulation (ETPS)

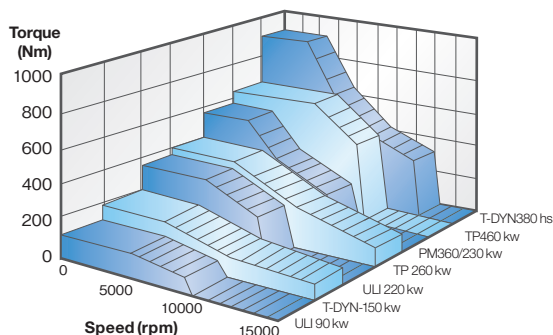
- Torque from combustion pressure
- Piston bore, inertia, the number of cylinders, stroke
- Mean torque by special "rotating" filter
- Angular Acceleration on FEAD
- Engine friction
- Engine flywheel inertia



Engine Torque Pulsation Simulation (ETPS)

Ultra-Low Inertia AC Dynamometer

HORIBA's TP-series high performance AC dynamometers produce high torque and acceleration rates of 50000 rpm/sec for gasoline and 20000 rpm/sec for diesel. It also features extremely small motor diameters, allowing a production half shaft connection for FWD transmissions.



Variations of AC Dynamometer

Mechanical Support

HORIBA's Virtual Engine System offers superior mechanical support components engineered to withstand the rigorous requirements of transmission development and durability testing. The dynamometer headstand offers superb flexibility, quickly accommodating different transmissions at mounting angles that match in-vehicle installations.



±90° Rotation, ±7° Tilting



Transmission Fixture Interface



Optional Specimen Mounting Plate

HybridTeam



Please read the operation manual before using this product to assure safe and proper handling of the product.

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Bulletin:HRE-2265A

Printed in Japan TH-G(SK)13